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Contemporary Comparison of Supra-Aortic Trunk Reconstructions for Occlusive Disease: Transthoracic Reconstructions Versus Extrathoracic Reconstructions

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Objectives: Open surgical reconstruction for supra-aortic trunk persists despite advances in endovascular therapy. Although extrathoracic reconstructions (ETR) developed as a safer alternative to transthoracic reconstructions (TTR), contemporary national data evaluating relative rates of operative outcomes are lacking.

Methods: Using the National Surgical Quality Improvement Program (NSQIP; 2005-2011), patients who underwent TTR or ETR were evaluated. Patients with nonocclusive indications were excluded. The primary outcome was a composite endpoint of cerebrovascular accident (CVA)/myocardial infarction (MI)/death. Secondary outcomes were 30-day postoperative complications. Univariate and multivariable regression analysis were performed.

Results: Overall, 83 (10.7%) patients underwent TTR and 692 (89.3%) underwent ETR. Vascular surgeons performed most TTR (96%) and ETR (97%). Most common ETR were carotid-subclavian (68%), carotid-carotid (14%), and subclavian-transposition (7%). Less commonly, axillary-axillary (6%), subclavian-axillary (2%), subclavian-subclavian (1%), and carotid-transposition (1%) were performed. Ten percent (TTR) and 8% (ETR) patients had a concurrent CEA at time of operation ($P < .60$). Baseline characteristics are presented in table. Analysis of 20+ characteristics showed the groups did not differ significantly. The two groups had similar rates of CVA (1.2% in TTR group vs 2.2% in ETR; $P > .99$), MI (0% vs 1.3%; $P = .61$), death (2.4% vs 1.3%; $P = .33$), and CVA/MI/death (3.6% vs 3.8%; $P > .99$). TTR patients had longer hospital stays (6.3 days vs 4.0; $P < .0002$), received more transfusions (8.4% vs 2.5%; $P < .0096$), and had more septic (3.6% vs 0.3%; $P < .01$) and venous thromboembolic complications (3.6% vs 0.4%; $P < .02$). After adjustment for other factors, including surgical approach, CVA/MI/death was significantly associated with postoperative pneumonia (odds ratio, 11.0; 95% confidence interval, 2.07-58.72; $P < .005$), and postoperative return to operating room (odds ratio, 4.2; 95% confidence interval, 1.37-12.71; $P < .012$).

Conclusions: At U.S. hospitals, ETR is the more common reconstruction for supra-aortic trunk occlusive disease. Both approaches carry acceptably low rates of death, MI, and stroke. TTR results in more resource utilization due to its postoperative complications and greater complexity.

Readmissions and Reinterventions After Revascularization for Mesenteric Ischemia

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Background: Percutaneous angioplasty ± stenting (PTA/S) is increasingly employed for acute (AMI) and chronic (CMI) mesenteric ischemia. Compared with open revascularization (OR), PTA/S is associated with increased restenosis/reintervention. It is unclear whether rising PTA/S numbers represent treatment of new patients vs reinterventions in the same patients.

Methods: Using the California and Florida 2006-2009 Healthcare Cost and Utilization Project State Inpatient Databases/State Ambulatory Surgery Databases, we identified patients with AMI and CMI undergoing OR and PTA/S. Revisits included subsequent ambulatory PTA/S or admissions with/without reintervention.

Results: There were 554 repairs for AMI (51% OR, 49% PTA/S) and 955 for CMI (17% OR, 83% PTA/S [30% ambulatory]). For AMI patients undergoing an index OR, revisit rates at 1/2/3 years were 0.7/1.1/1.1% for repeat OR, 0.0/0.4/0.7% for subsequent PTA/S, and 5.9/8.1/8.4% for readmissions without repair. Revisits after PTA/S for AMI were 0.8/1.5/1.9% for OR, 1.9/2.3/3.8% for re-PTA/S, and 8.0/10.6/11.0% for readmission without repair. For CMI patients undergoing OR, revisit rates were 1.4/2.8/2.8% for repeat OR, 3.5/4.9/5.6% for subsequent PTA/S, and 4.9/4.9/5.6% for readmissions without repair. Revisits after PTA/S

Figure. Number of mesenteric revascularizations performed for CMI in California and Florida for both acute and chronic mesenteric ischemia, including and excluding revisits.

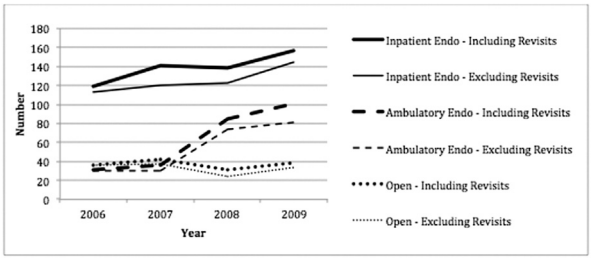

Fig.

Table. Demographic and clinical characteristics of entire cohort

Variable	*Overall, % (n = 775; 100%)*	*Transthoracic, % (n = 83; 10.7%)*	*Extrathoracic, % (n = 692; 89.3%)*	P *value*
Male gender	44.8%	32.5%	46.2%	.04
Caucasian race	92.4%	92.2%	92.4%	.95
Current smoker	45.9%	44.6%	46.1%	.80
Dialysis-dependent	1.3%	4.8%	0.9%	.02
History of transient ischemic attack or CVA	35.6%	36.3%	35.6%	.90
History of angina or MI	5.4%	3.8%	5.6%	.79
Previous percutaneous coronary intervention	17.6%	12.1%	18.2%	.33
Previous cardiac surgery	18.1%	7.2%	19.4%	.02
History of revascularization or amputation for peripheral vascular disease	17.8%	16.9%	17.9%	.90
History of severe chronic obstructive pulmonary disease	15.4%	10.8%	15.9%	.23
History of congestive heart failure	1.3%	0%	1.5%	.61
Functionally independent prior to surgery	95.4%	97.6%	95.1%	.41

CVA, Cerebrovascular accident; *MI*, myocardial infarction.

for CMI were 1.8/2.0/2.1% for OR, 7.1/9.5/9.8% for repeat PTA/S, and 6.6/7.8/8.4% for readmission without repair. During the index admission, mortality after OR was higher than PTA/S for both AMI (35% vs 19%; $P < .001$) and CMI (10% vs 2%; $P < .001$). Three deaths occurred during a revisit: two after OR, one after PTA/S; all three for CMI. When revisits were excluded, the rise in PTA/S procedures persisted for CMI (Fig).

Conclusions: Revisits after mesenteric revascularization are most frequent after PTA/S for CMI. After excluding reinterventions, numbers of PTA/S are still increasing, so the rise in PTA/S is attributable mostly to treatment of new patients. PTA/S is increasingly being performed in the outpatient setting.

Evolving Treatment Patterns for Type B Aortic Dissection: Sicker Patients, Better Results

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Objectives: The application of thoracic endovascular aortic repair (TEVAR) has changed treatment paradigms for thoracic aortic disease. We sought to better define specific treatment patterns and outcomes for Type B aortic dissection treated with TEVAR or open surgical repair (OSR).

Methods: Medicare patients undergoing thoracic aortic dissection repair (2000-2010) were identified using a validated International Classification of Diseases-Ninth Revision diagnostic and procedural code-based algorithm. Trends in utilization were analyzed by procedure type (OSR vs TEVAR), and secular patterns in patient characteristics and outcomes were examined.

Results: Total thoracic aortic dissection repairs increased by 21% between 2000 and 2010 (2.5 to 3 per 100,000 Medicare patients; $P < .001$; Fig). A concomitant increase in TEVAR was seen during the same interval (0.03 to 0.8 per 100,000; $P < .001$). By 2010, TEVAR comprised 27% of all repairs. TEVAR patients had higher rates of comorbid congestive heart failure ($P < .001$), chronic obstructive pulmonary disease ($P < .001$), diabetes ($P < .001$), and chronic renal failure ($P < .001$) when compared with OSR. For all repairs, patient comorbidity burden increased over time (proportion of patients with Charlson comorbidity score greater than 2: 13% in 2000, 18% in 2010; $P < .001$). During this same interval, in-hospital mortality rates declined from 47% to 23% ($P < .001$). While in-hospital mortality rates and 3-year survival were similar between patients selected for TEVAR and OSR, women had slightly lower 3-year survival following TEVAR (60% women vs 63% men; $P = .05$).

Conclusions: Surgical treatment of type B aortic dissection has increased over time, reflecting an increase in the utilization of TEVAR, and is currently performed in sicker patients with better outcomes. While perioperative mortality has improved for both OSR and TEVAR, slightly worse survival for women with TEVAR requires further investigation.

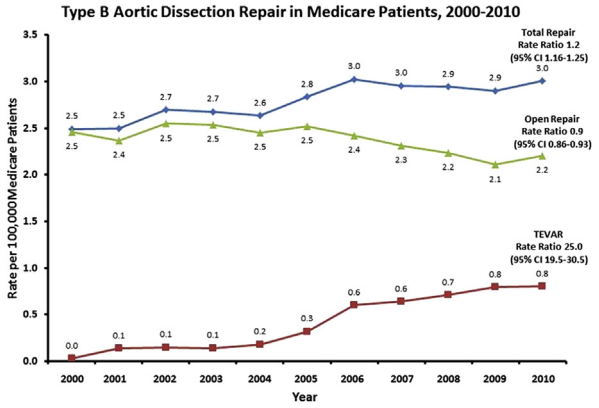

Fig.

Late Aortic Remodeling Persists in the Stented Segment After Endovascular Repair of Acute Complicated Type B Aortic Dissection

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Objectives: Thoracic endovascular aortic repair (TEVAR) for acute complicated type B dissection (cTBD) promotes early positive aortic remodeling. However, little is known about the long-term effect of TEVAR on the dissected aorta, which is the goal of this study.

Methods: Between August 2005 and August 2009, 31 patients with cTBD were treated with TEVAR and had long-term (>1 year) follow-up imaging. CTA obtained at 1 month (1M), 1 year (1Y), and long-term (LT; average 42 months) were compared with baseline (BL) scans. The largest diameters of the stented thoracic aorta (SMAX), stented true lumen (STL), and stented false lumen (SFL) were recorded at each time point, as were the values in the unstented distal thoracic aorta and the abdominal aorta. Changes over time were evaluated using a mixed effect analysis of variance model of repeated measures.

Results: Demographics: age 56 years; 74% male. Indications for TEVAR: 61% malperfusion, 32% refractory hypertension, 45% impending rupture, 32% persistent pain; 58% had >one indication. The average length of aorta covered was 19 cm. Aortic remodeling along the stented segment is summarized in Fig 1. The SMAX remained stable ($P =$ not significant), STL increased ($P < .001$), and SFL decreased ($P < .001$) over time; 84% had complete false lumen (FL) obliteration. For the uncovered segment, the maximum diameter increased ($P = .014$), as did TL ($P < .001$) and the visceral segment ($P < .001$). The FL was stable ($P =$ not significant). The

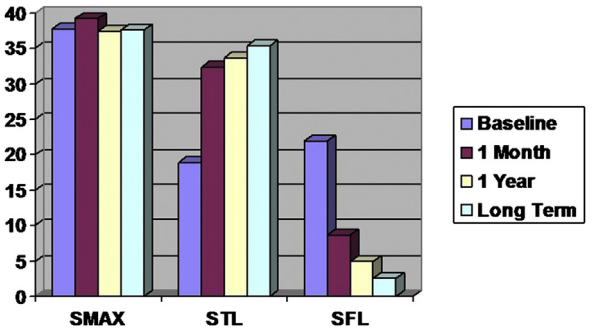

Fig 1. Remodeling of the stented aortic segment over time. *SFL,* Stented false lumen; *SMAX,* maximum stented diameter; *STL,* stented true lumen.

average growth of the visceral segment was 31% in patients with a patent FL vs 3% in those without ($P = .004$). One patient had aneurysmal degeneration of the false lumen and required an additional endograft at 2 years.

Conclusions: TEVAR of cTBD promotes long-term remodeling across the stented segment with FL obliteration in 84% of patients. However, FL obliteration beyond the stented segment appears necessary to prevent late aneurysmal degeneration.

Results of Transcaval Embolization for Sac Expansion from Type II Endoleaks After EVAR

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Objectives: The increase of endovascular aortic repair (EVAR) has been accompanied by a consequent increase in Type II endoleaks. This study reports our experience with transcaval coil embolization (TCCE), a novel strategy to treat this complication.

Methods: We reviewed 24 consecutive patients undergoing TCCE from 2010 to 2013. Demographics, operative details, and outcomes were assessed.

Results: Since 2006, over 450 EVARs have been performed at our institution with 24 TCCE performed in 22 patients for sac expansion from Type II endoleaks. Patients were male (87%) former or current smokers (87%) with an average age of 78 (±7.2) years. TCCE was performed a mean of 4.2 (±4) years after initial EVAR (21% for rupture). Endoleaks resulted in a mean sac growth of 1.2 (±0.9) cm diameter and 38% ± 35% volume. Forty-two percent had failed prior procedures (five translumbar, two transcaval, two aortic cuff, two internal iliac branch embolization, and one fenestrated branched endograft). Two patients had ultimate sac access between the endograft iliac limb and arterial wall after transcaval puncture failed with an overall 87% technical success (79% for